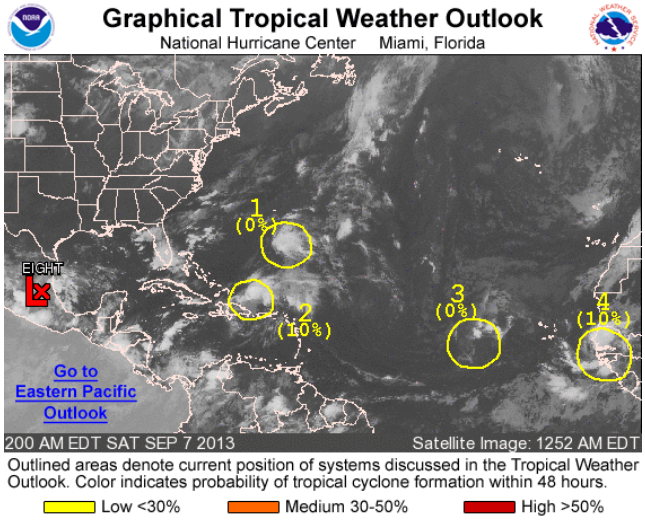
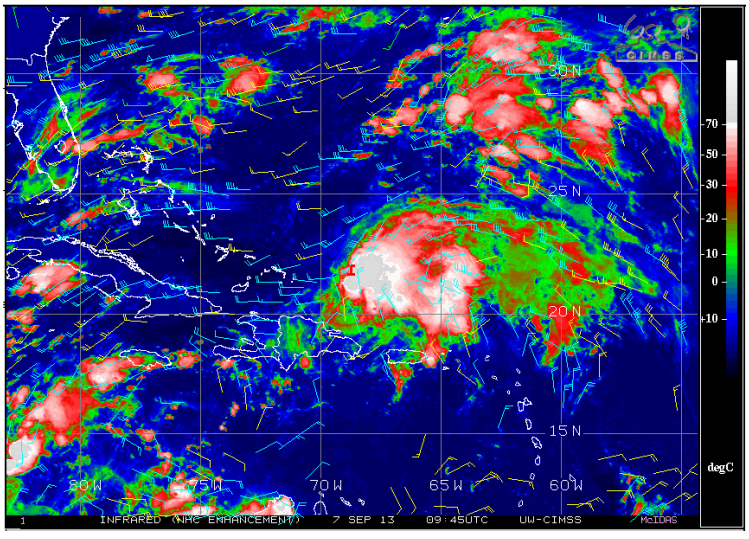
Hurricane and Severe Storm Sentinel (HS3) Mission

HS3 2013.09.07-08 Flight Report: GLOBAL HAWK AV-6 mission to former Gabrielle

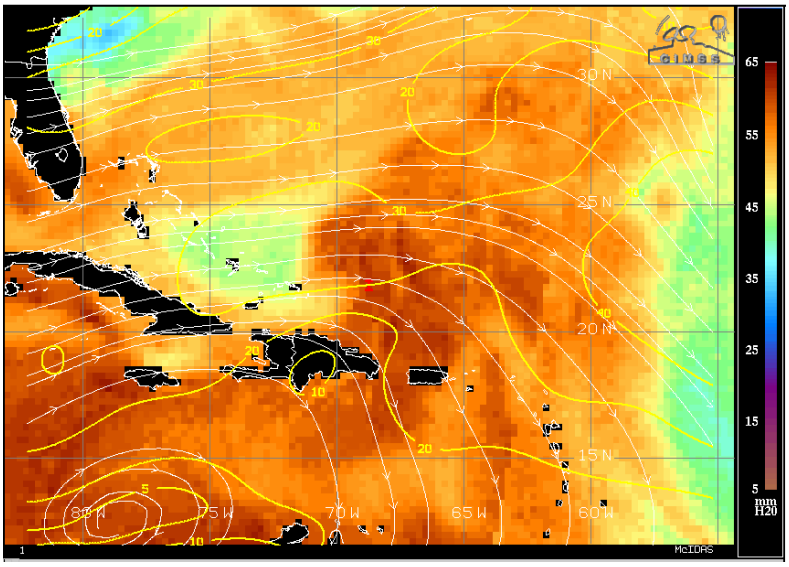
Mission Scientists:
Shift 1 (0800-1700 UT): Scott Braun/Pete Black/Jim Doyle
Shift 2 (1600-0100 UT): Jason Sippel/Deanna Hence/Ed Zipser
Shift 3 (0000-0900 UT): Steve Guimond/ Paul Newman/Mike Montgomery
Shift 4 (0800-1200 UT): Scott Braun/ Pete Black/Jim Doyle

Mission goal: This mission is a follow on an earlier back-to-back set of flights into TS Gabrielle, which formed and dissipated during the Sept 4-5 AV-6 flight. The NHC is currently given the disturbance northeast of the Dominican Republic a 10% chance of formation in the next 48 hours and 40% chance in the next 5 days.

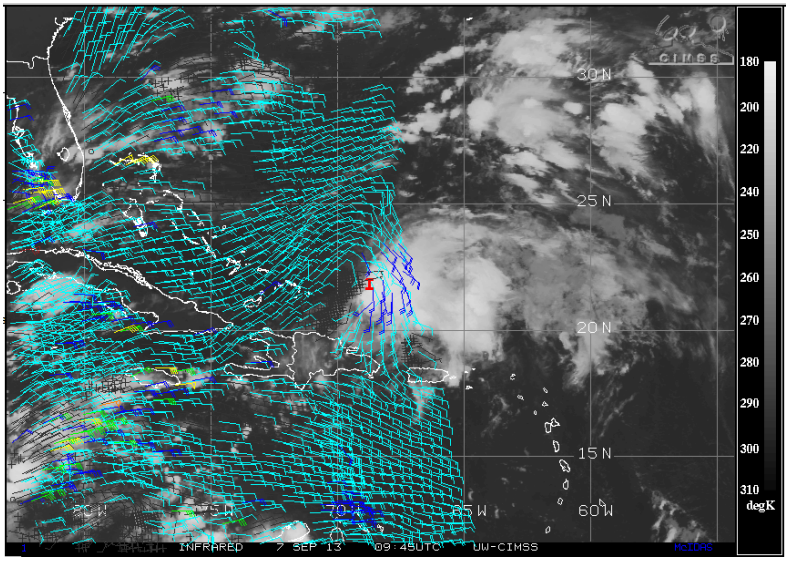




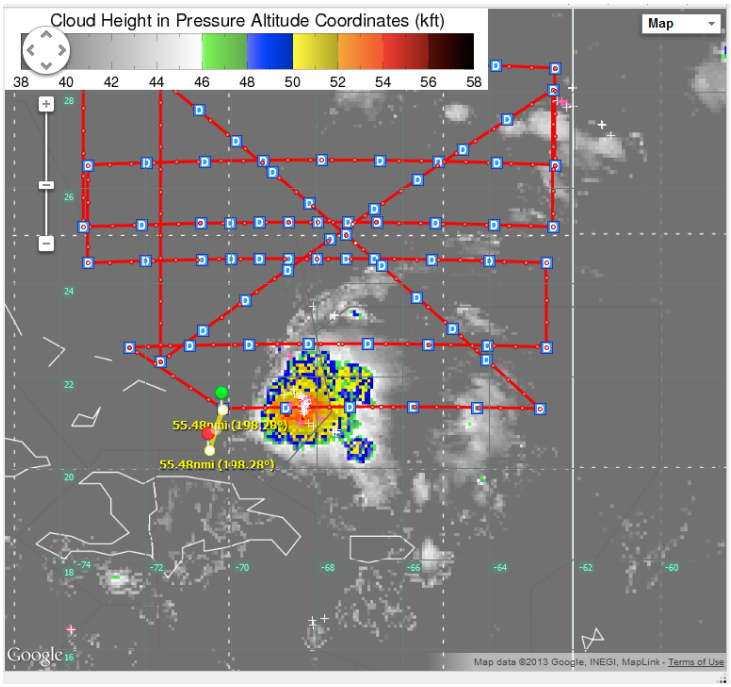
The GOES IR data above shows a significant burst of convection this morning in highly sheared conditions. All of the convection appears to be downshear of the surface wave axis.



Shear values (above) are ~30 knots, with dry mid-level air indicated on the upshear (western) side of the disturbance. That could pose some problems for development in the near term, as NHC suggests.



OSCAT (western part of pattern) and ASCAT (over the wave axis) show a sharp wave axis on the western side of the deep convection.



Cloud top heights are getting up to 54-56 kft in the convective burst. Lightning is present. Because the storm is moving northward much more slowly than originally anticipated, we will be modifying the flight pattern, starting with the broad lawnmower and the doing a more focused lawnmower over the storm, with the southernmost leg going a bit farther southward than the last leg shown above. The flight planner is currently working the plan and will get it to the pilots ASAP.

The NOAA G-IV and P-3 (NOAA 42) will be taking off at 10am EDT for ~8 h missions.

1058 Engine start

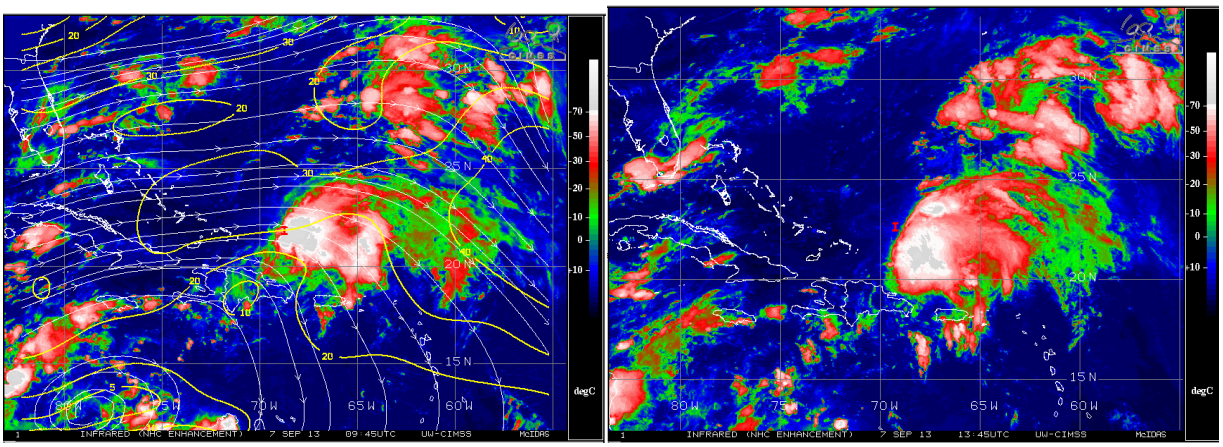
1204 Started taxi

1208 Takeoff

1300 Leaving W-386.

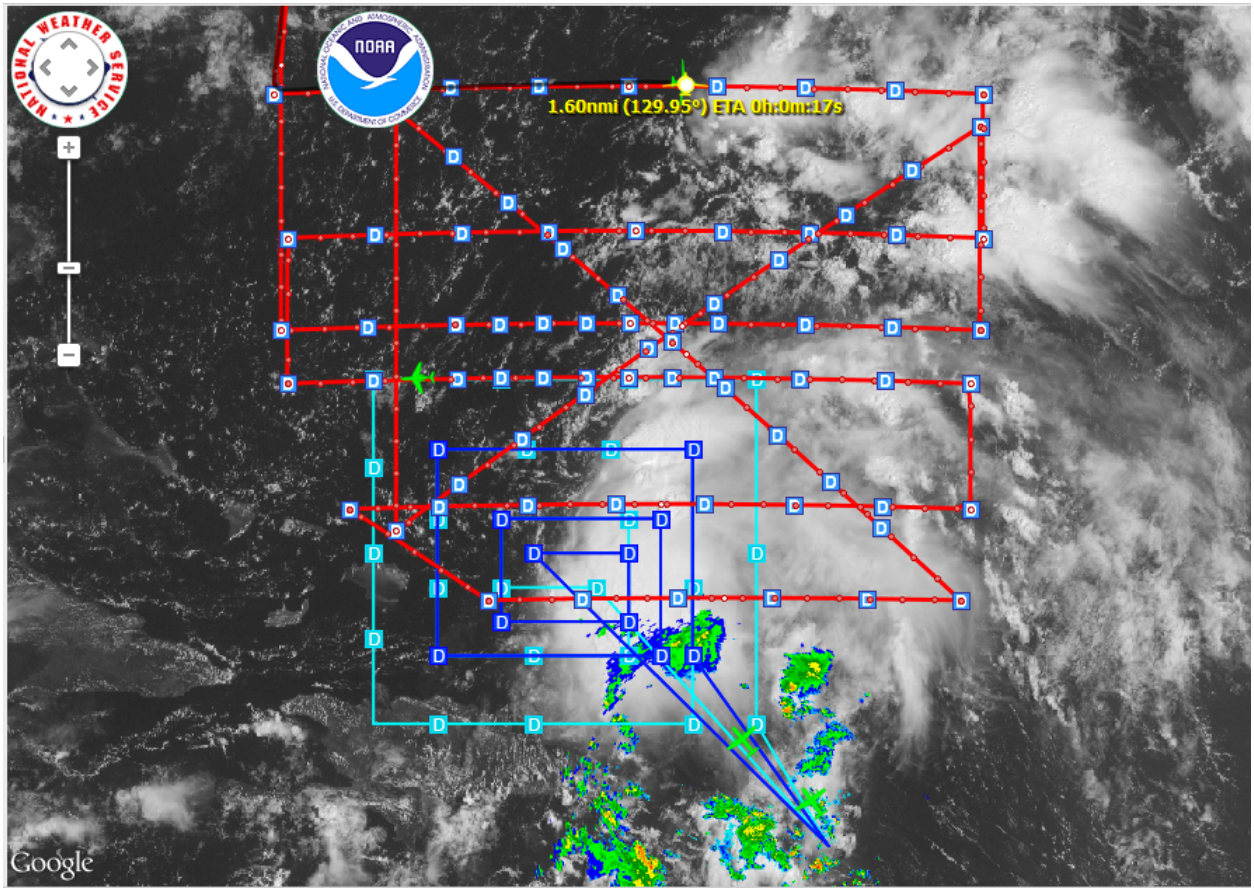
1428 First dropsonde released. Good data.

1458 Second dropsonde released. Good data.

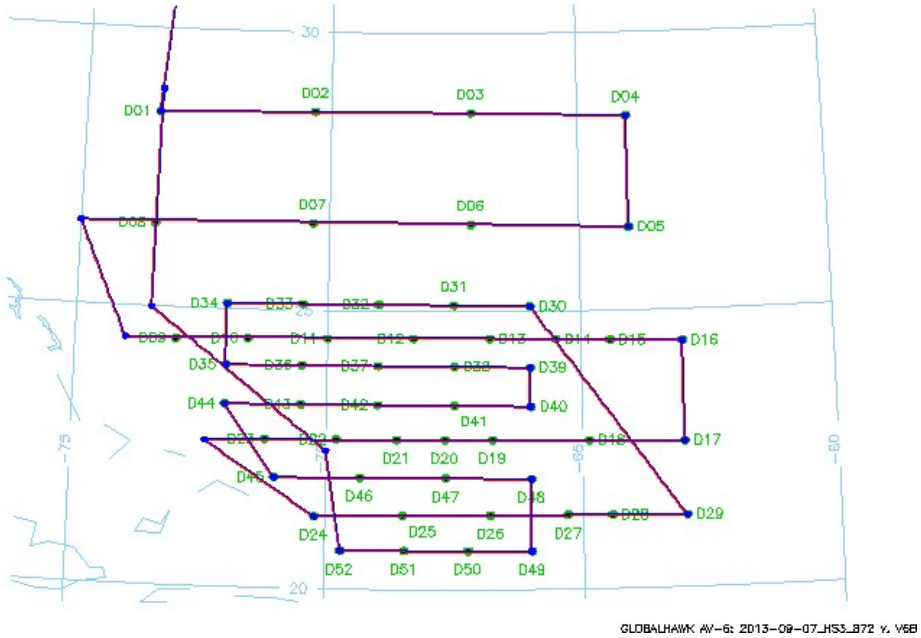


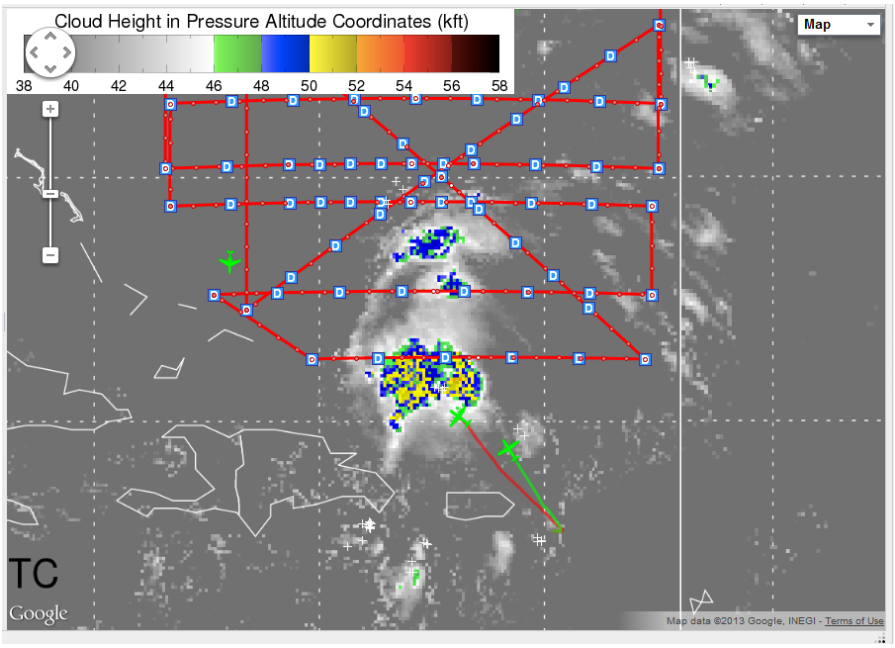
Convection starting to show signs of waning. There was an interesting apparent movement of the cells southward as can be seen above.

1528 Third dropsonde released. Good data.



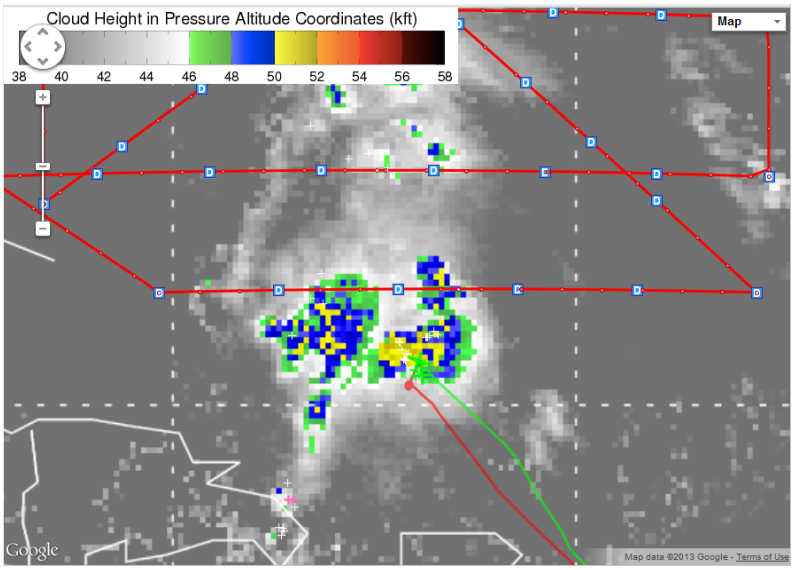
The above image shows the tracks of the G-IV (currently flying) and the P-3 (NOAA 42). NOAA 43 is also in the air, but their path is not available. The GH track is still the original pattern. Flight planner is having trouble with software, unable yet to upload to MTS. The new path is shown below as an image for now.





Cloud tops heights (1515 UTC) are collapsing a bit. No more heights much above 52 kft, only a few lightning obs.

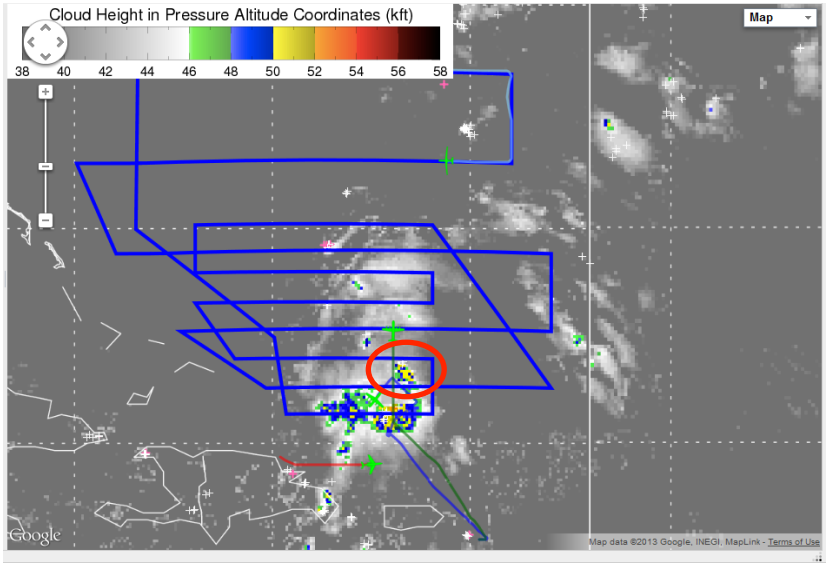
1600 Fourth dropsonde released. Good data.



Cloud tops at 1555 UTC show continuing height decreases of the cloud tops.

1622 Fifth dropsonde released. Good data.

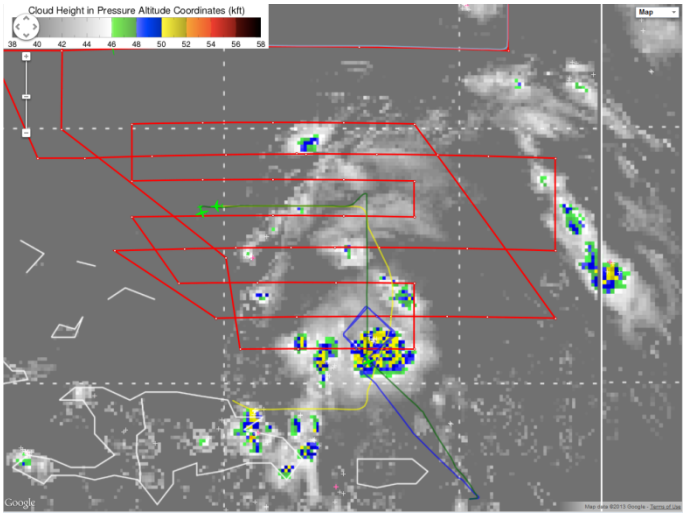
1635 Deanna Hence, Jason Sippel, and Ed Zipser taking over. New area of convection appearing to the NE side of the main convective area.



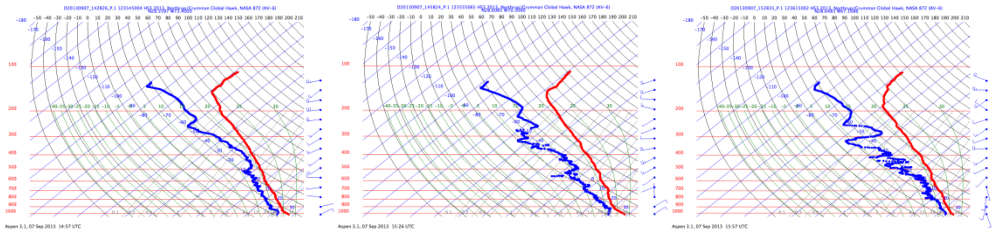
1649 Dropsonde 6 released. Good launch and data.

1719 Dropsonde 7 released. Good launch and data.

1739 Convection reinvigorating in the SE side of the storm circulation.

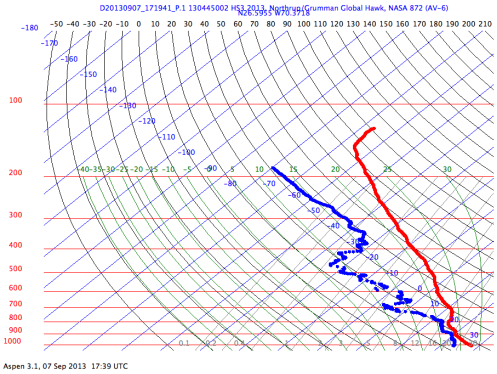


1746 Dropsondes along the northern edge indicate moist low-level conditions on either side of a dry tongue.



1750 Dropsonde 8 released. Good launch and data.

1815 The 1719 Drop (drop 6) had a fast fall so has no wind data retrievable. However shows intensely dry air in the mid levels associated with the dry tongue wrapping into the storm center.

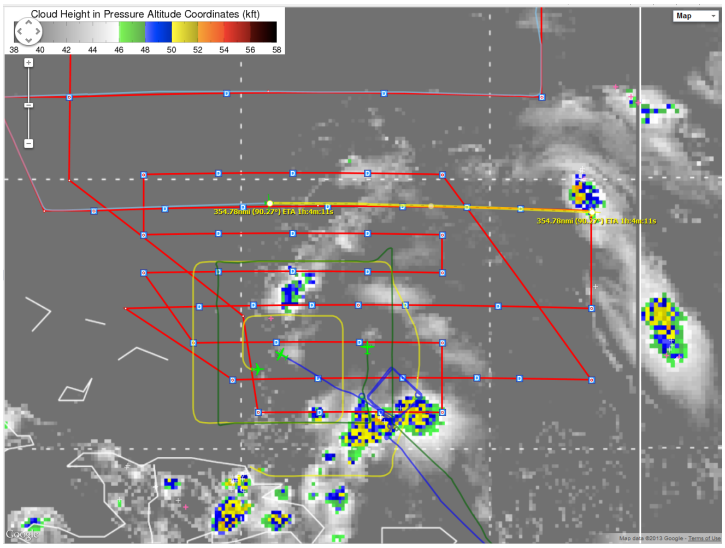


1838 Dropsonde 9 released. Good launch and data.

1852 Dropsonde 10 released. Good launch and data.

1907 Dropsonde 11 released. Good launch and data.

1914 Big band of relatively high cloud tops with deep convection ahead. Also noting the recurrence and collapse of convection near the storm circulation, as well as in the zone to the SE of the circulation that the other aircraft are focusing on. According to Scott, GEOS-5 is indicating that the critical area may be this convection that keeps attempting to fire near the low-level center.



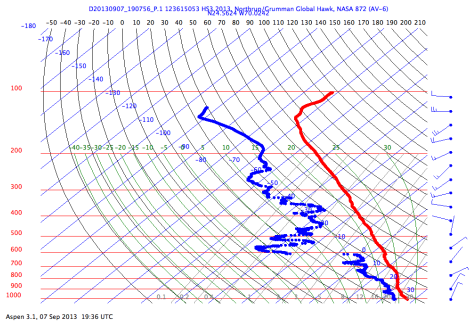
1925 Dropsonde 12 released. Good launch and data.

1940 Dropsonde 13 released. Good launch and data.

1952 Dropsonde 14 released. Good launch, intermittent data at first because of Ku down. When Ku was back up, good launch and data.

2002 Dropsonde 15 released. Good launch and data.

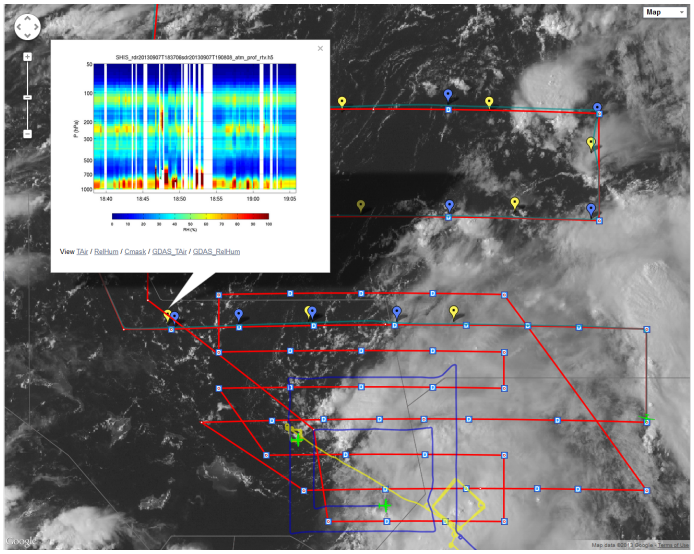
2008 Strong midlevel dry air evident in drop 11, may be foiling attempts of convection forming near the low-level center.



2016 Dropsonde 16 missed due to unknown AVAPS problem.

2021 Dropsonde 16 released at 23.989, -62.995, ~25 nm south of scheduled position. Sonde away, good data, GPS outage at first but came back.

2034 SHIS is also finding the bone-dry midlevel air that is wrapping around the western side of the circulation. NOAA43 has been circling at the low-level circulation center for the past while.



2037 Dropsonde 17, good launch and release.

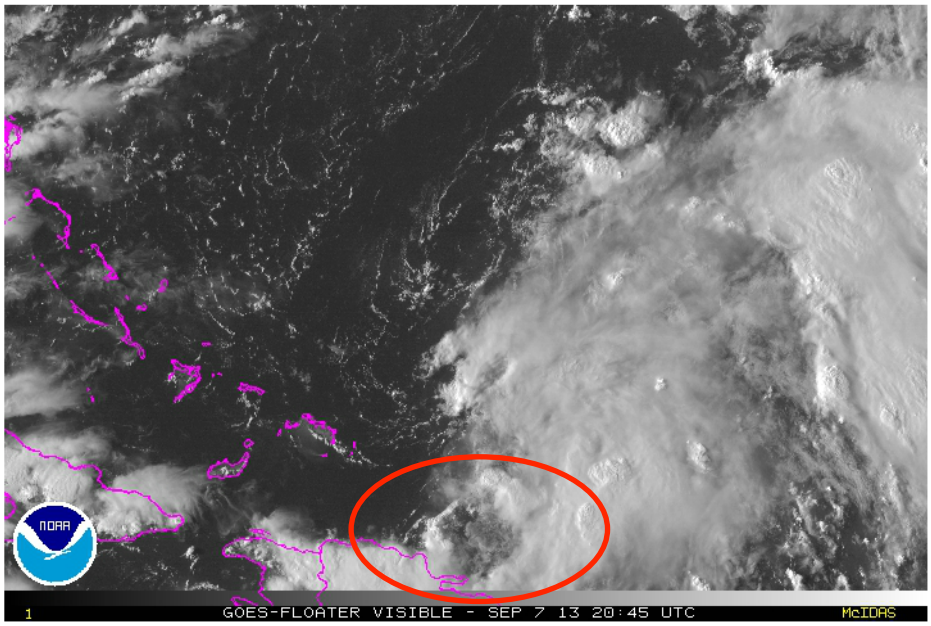
2050 Another AVAPS problem with loading the sondes.

2052 Dropsonde 18 missed due to AVAPS problem.

2055 Dropsonde 18 released at 22.682, -65.180. Good launch and data.

2111 Dropsonde 19 released. Good launch and data.

Nice outflow boundary surging from southern convection towards the north.



2115 In communication with CARCAH re: possible conflicts with drops 21 and 22, both with Teal 71 and N42.

2117 Drop 21 cleared from Teal 71 perspective.

2120 Dropsonde 20 released, good launch and data. Convection anywhere but the SE side is rapidly dissipating.

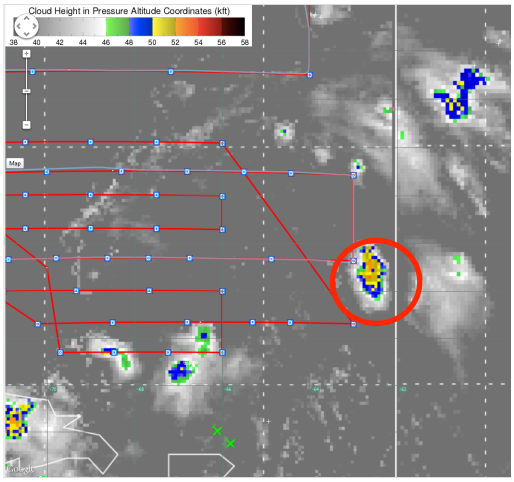
2126 Drop 22 cleared by N42 and Teal 71.

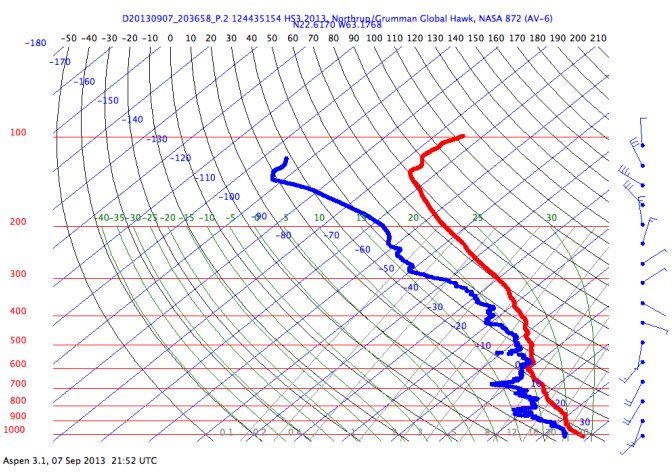
2129 Dropsonde 21 released. Good launch and data.

2139 Dropsonde 22 launch command sent. Good release, good data.

2150 Dropsonde 23 launch command sent. Good release, good data.

2212 D17, collected just before this cell violently exploded upward with lightning, indicates a deep layer of instability, as do several other sondes on this side of the disturbance. Thankfully we were away when it did!





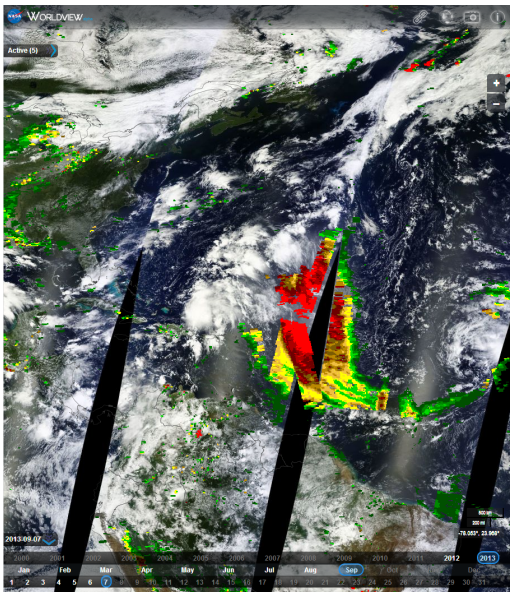
2229 Dropsonde 24 launch command sent. Good release and data.

2247 Dropsonde 25 launch command sent. Good release and data.

2255 CARCAH informs that there is no evidence of a low-level circulation, and that the recon marked a trough axis at 23.7N 69.7W, with a wind shift from west to south-southwest and most flight level winds along that axis from from SW to NW being < 8 kts.

2304 Dropsonde 26 Good release, good data.

2315 Modis AOD indicates that any dust present in this system is more on the eastern side. Source of dry mid-level air is dust free.



2320 Dropsonde 27 good launch and data.

2330 Dropsonde 28 launch command sent….launch and data look good.

2338 Interesting comment from Ed re: the sondes reporting saturation with respect to water in cirrus decks, thus showing low RH, vs. SHIS reporting saturation with respect to ice and thus showing more saturated conditions in upper levels.

2346 Dropsonde 29 launch and data good.

0001 Adding a sonde at 23N along the current flight track. To be dubbed 29a.

0005 Dropsonde 29a released, launch and data good.

0031 Dropsonde 30 released, launch and data good.

0045 Dropsonde 31 released, launch and data good.

0058 Dropsonde 32 released, launch and data good.

0112 Dropsonde 33 released, launch and data good. In briefing, current debate re: continuing with Gabrielle, pursuing 33L, or doing neither to conserve sondes.

0126 Dropsonde 34, good data.

0138 Dropsonde 35, good data.

0151 Dropsonde 36, good data.

0207 Dropsonde 37, good data.

0223 Dropsonde 38, good data.

0238 Dropsonde 39, good data.

NOTE: WE FOUND THAT WE ARE ~ 1HR AHEAD OF SCHEDULE SO WE ADDED 15 MINS TO EACH OF THE NEXT FOUR LEGS WITH DROPS AT EACH 15 MIN INTERVAL. THIS IS WHAT THE "a" and "b" denote next to the drops below…

0256 Dropsonde 39a, good data.

0303 Dropsonde 39b, good data.

0319 Dropsonde 40, good data.

0334 Dropsonde 41, good data.

0348 Dropsonde 42, good data.

0402 Dropsonde 43, good data.

0415 Dropsonde 44, good data.

Holding off on 0430 Drop due to air traffic.

0434 Dropsonde 45, good data.

0447 Dropsonde 46, good data.

0503 Dropsonde 47, fast fall.

0520 Dropsonde 48, good data.

0538 Dropsonde 48a, good data.

0550 Dropsonde 48b, good data.

0605 Dropsonde 49, good data.

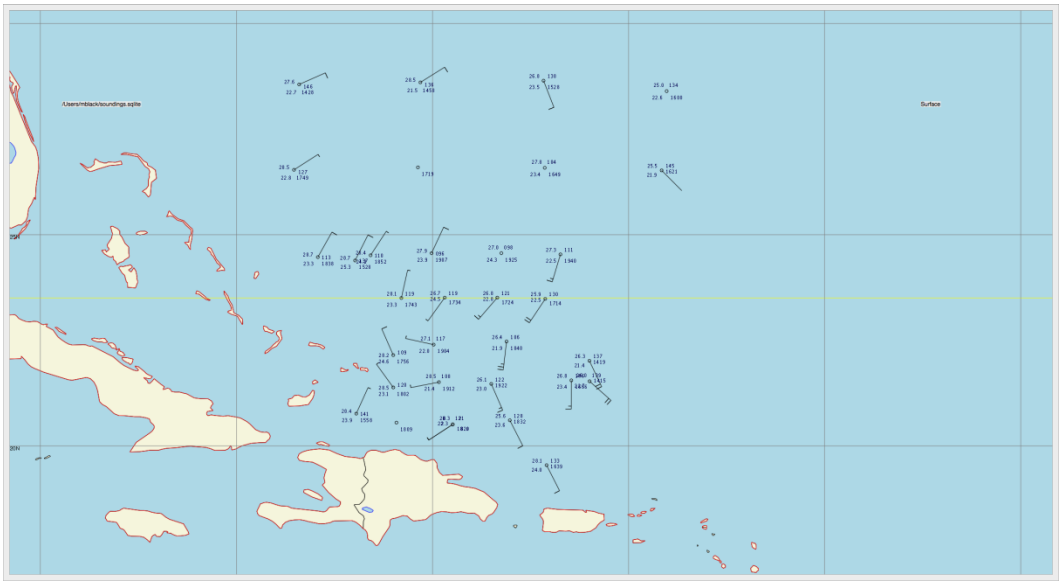
0616 Dropsonde 50, good data.

0640 Dropsonde 52, good data.

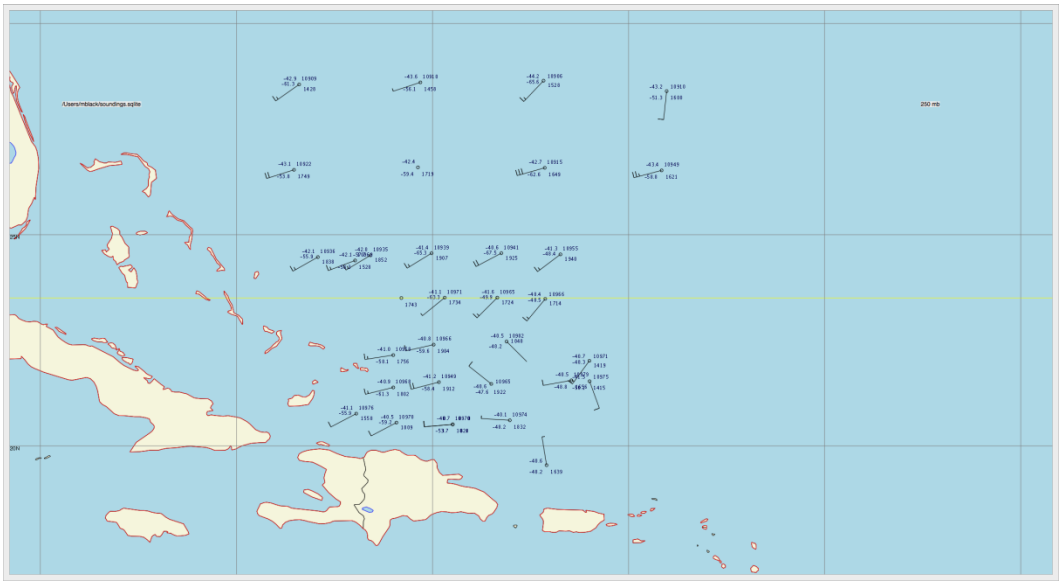
AV-6 returning home now.

Total number of dropsondes is 57, with one known fast fall and possibly one dropsonde with GPS receiver problem. Drop quality looks considerably improved over 2012 HS3, with thermo and wind data reporting to 1000 mb.

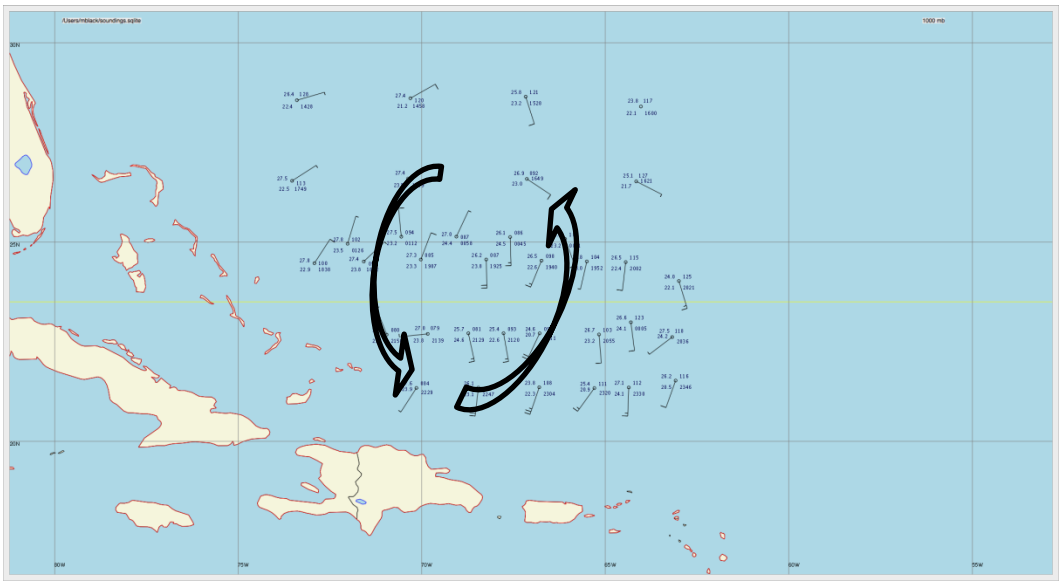
0146 Synoptic map of both GH and G-IV dropsonde surface winds updated as of 2044 UTC (a bit old). There are signs of a broad-scale circulation but not much in the way of a closed circulation.



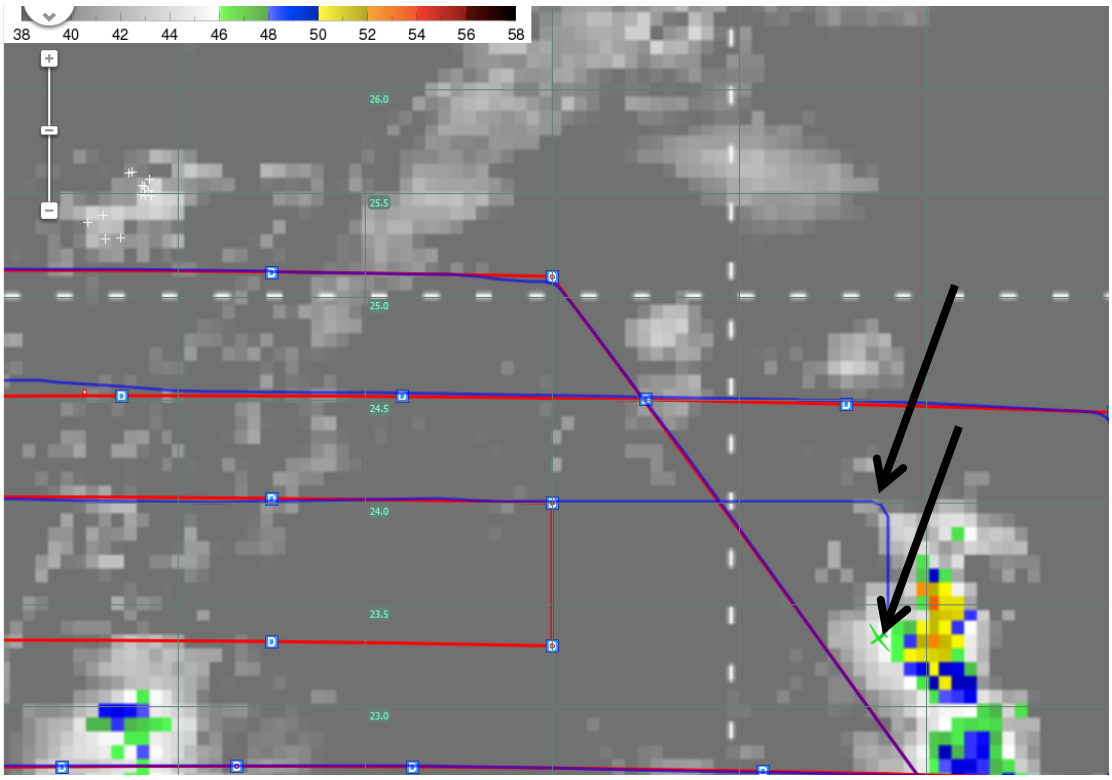
0200 Synoptic map of GH dropsonde winds at 250 hPa updated as of 2044 UTC. Winds at this level are all out of the West or Southwest. In the Northern part of the domain the winds are 20 – 30 kts and ~ 10 kts in the Southern part of the domain. The stronger winds to the north are associated with strong shear, which is displacing convection downstream.



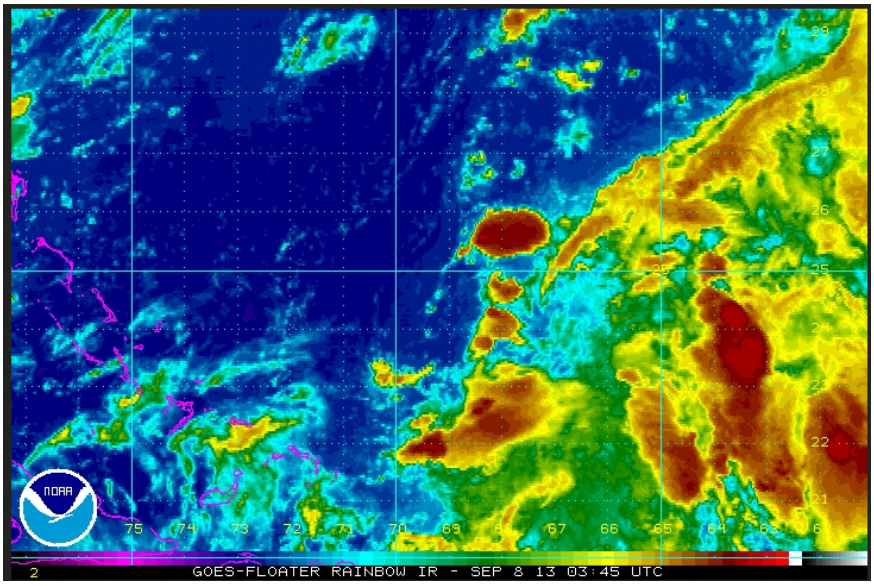
0230 Synoptic map of dropsonde winds at 1000mb updated as of 0212 UTC showing signs of a weak circulation at this level. (Not all dropsondes have been analyzed at this time. See 0551 UTC synoptic map below.)



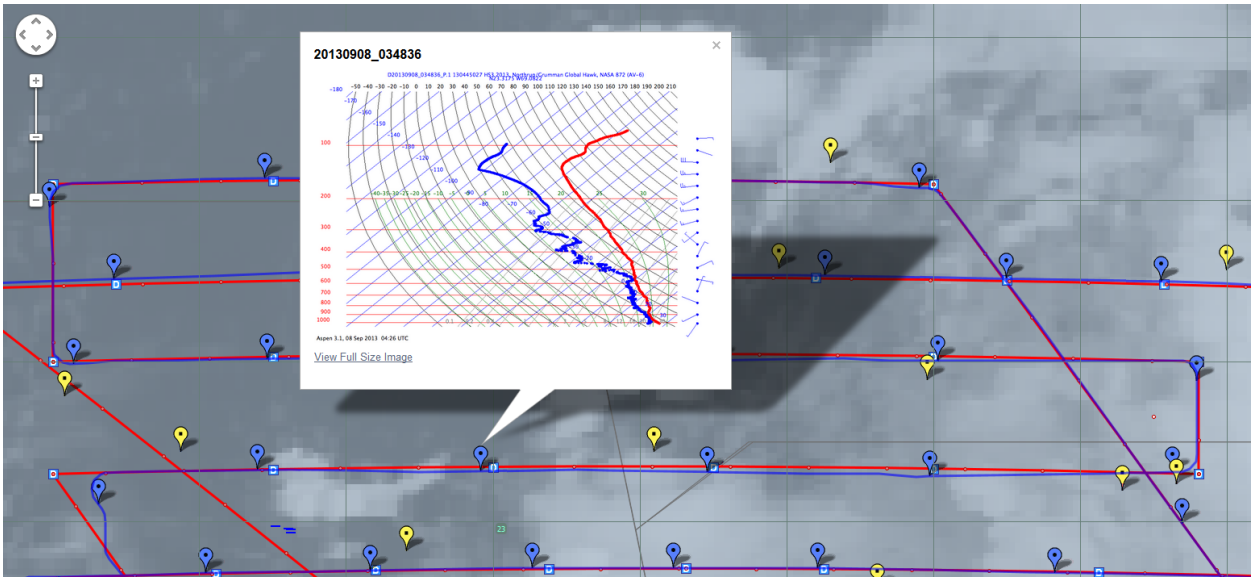
0306 Snapshot of the 15 min leg extensions added because we had an extra hour on station. New drops shown by the black arrows.



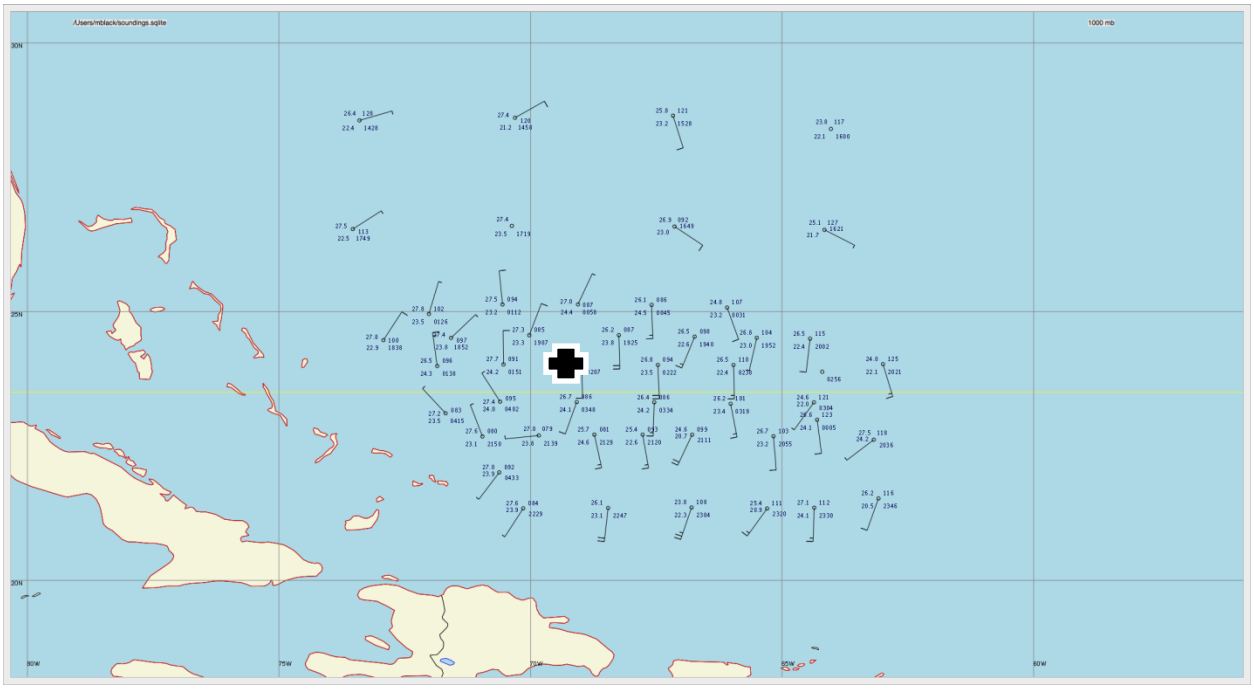
0434 Snapshot of convective structure of Gabrielle showing some bursts along the western periphery of the convection. The overall convective field has been reduced tonight, but intermittent bursts of convection have been apparent. They are occurring well to the East of the weak low-level cyclonic circulation defined by the GH dropsondes.



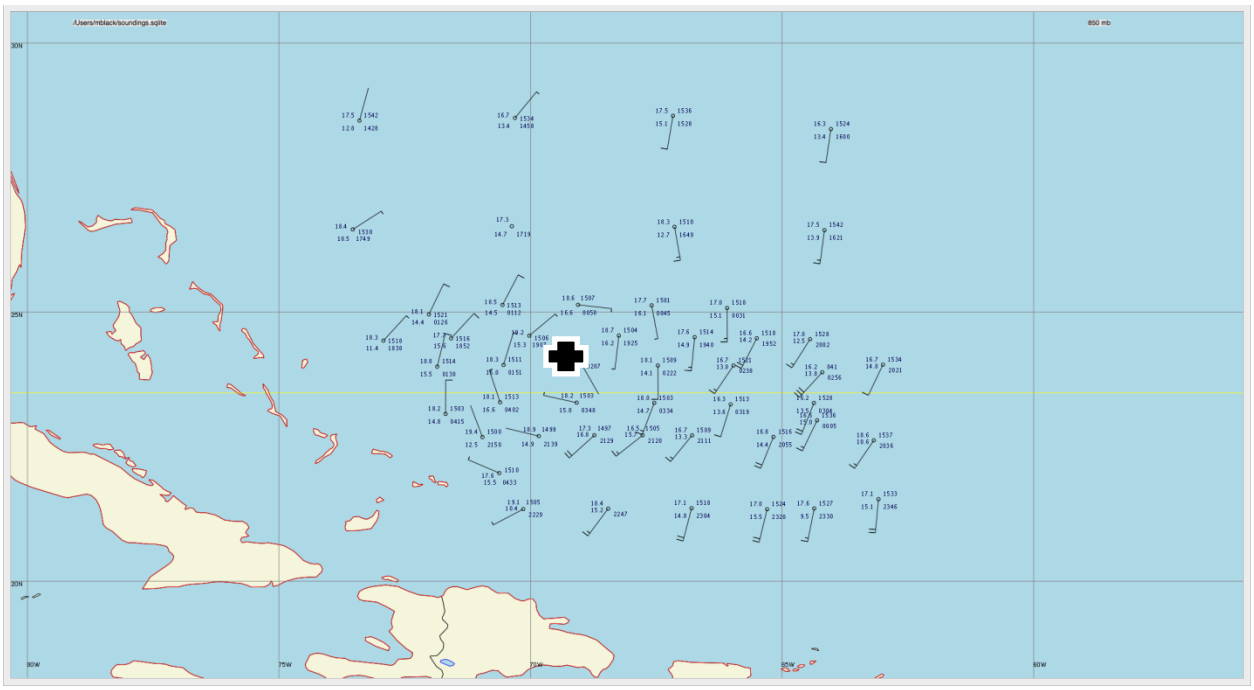
0503 Outside of the convection, the dropsonde data suggests that the lower levels are still saturated with weak winds.



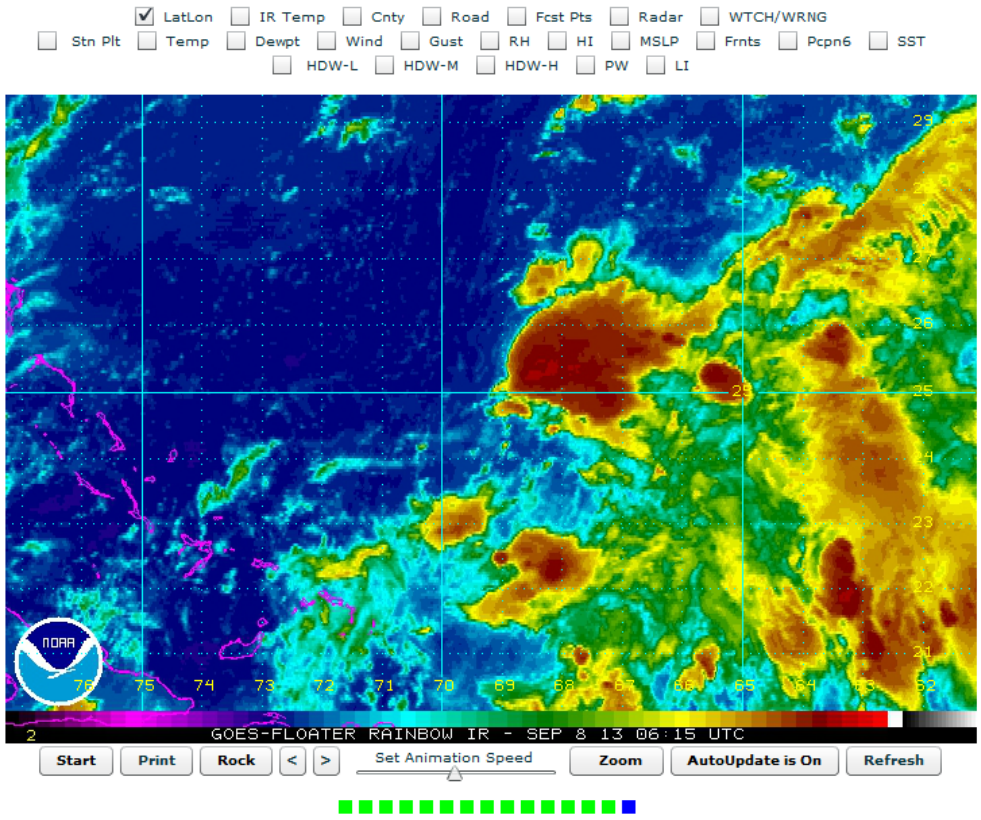
0519 1000 mb dropsonde wind map showing a nearly closed circulation (centered near the “X”) that may be somewhat elongated (oriented from SW to NE).



0551 850 mb dropsonde wind map showing a clear closed circulation with winds of 20 – 30 kts on the Eastern side and 10 kts on the Western side.

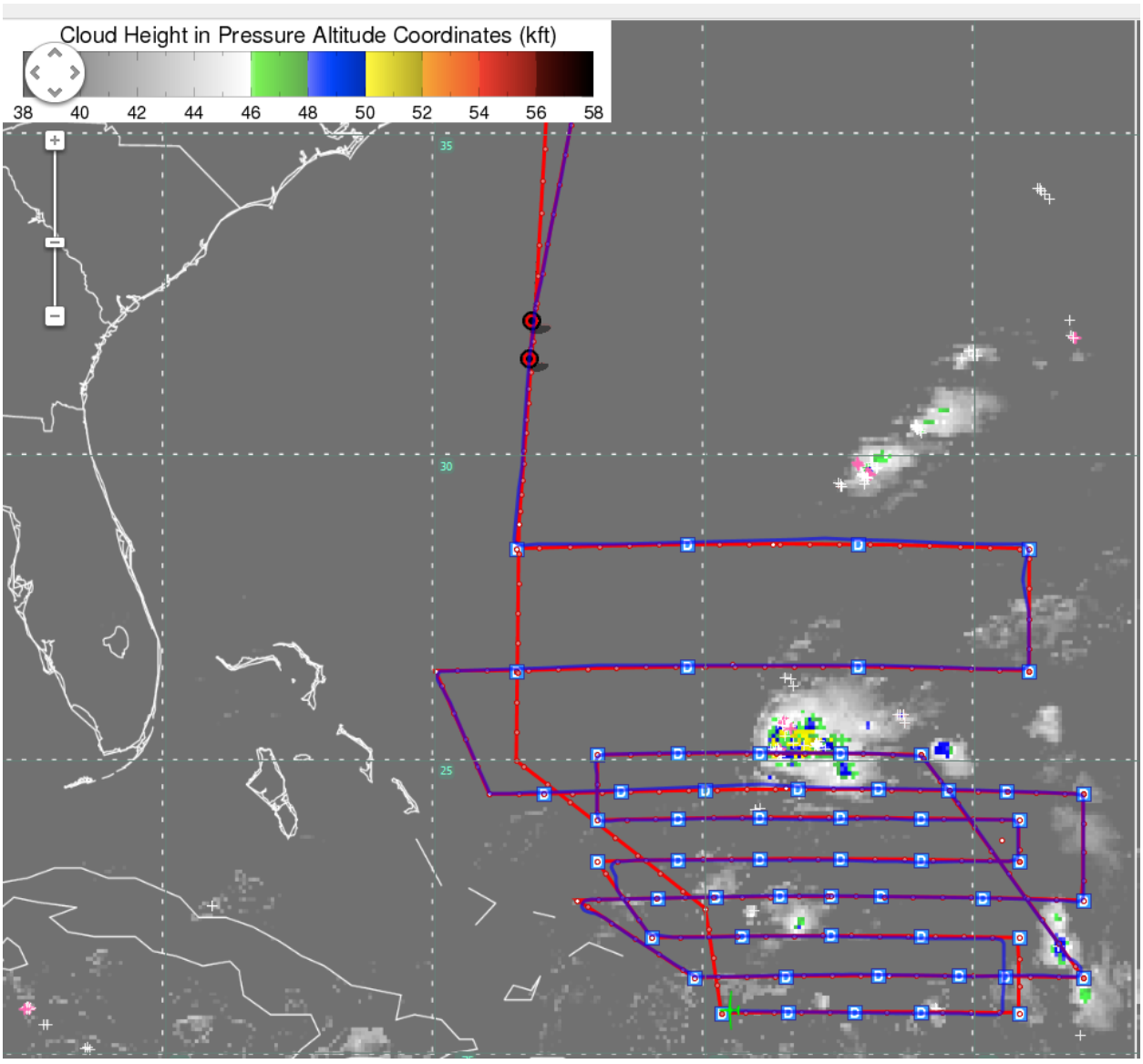


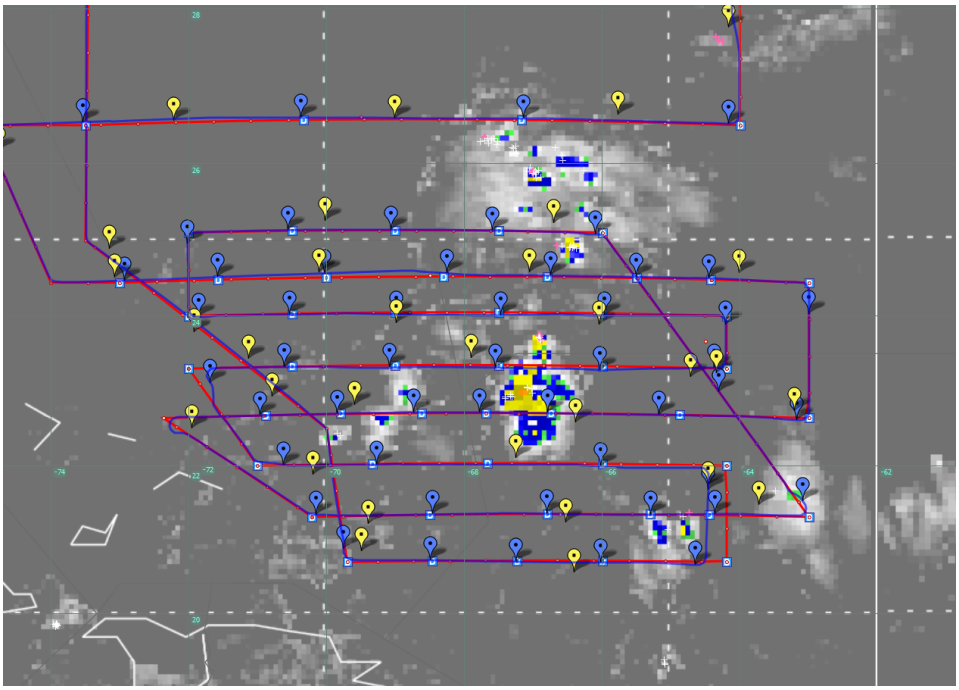
Gabrielle Long Floater - Rainbow Color Imagery Loop



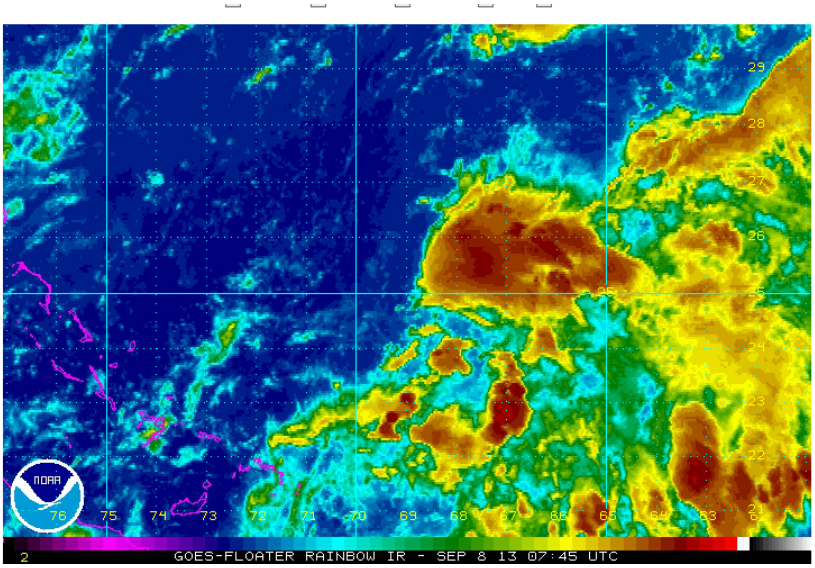
This loop intended for informational purposes only!
For Emergency situations and/or decisions, please refer to your local Emergency Management Office.
Additional Flash Information

During the final two legs of the drop pattern, the AVN satellite imagery suggested that a resurgent convective flare up was occurring on the eastern and northern end of the low-level cyclonic circulation. The AVN image near the end of the drop pattern at 0615 UTC is shown above. The apparent center of the convective flare up is between 68 and 69 Lon and north of 25 Lat. The cloud-top height product with the flight track and aircraft location is shown below, confirming that the convection to the northeast of the low-level circulation is deep at this time.


Cloud Height in Pressure Altitude Coordinates (kft)
38
40
42
44
46
48
50
52
54
56
58
35
30
25



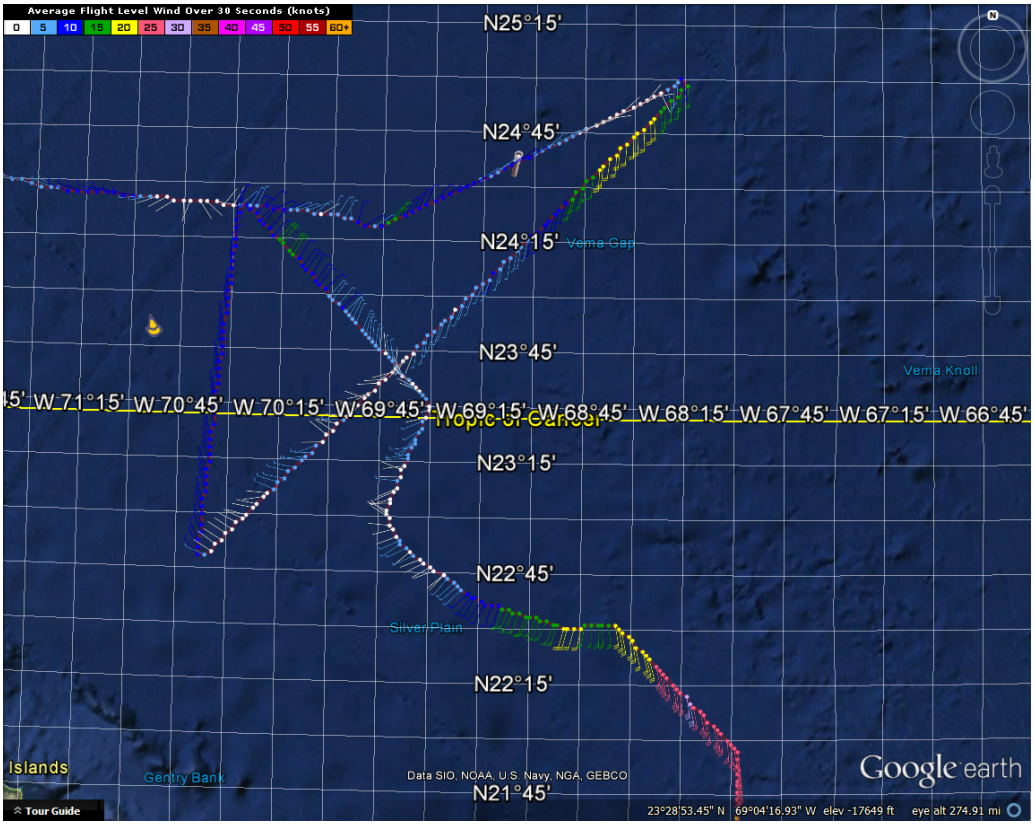
0833 Convection becoming more active near 23.0N -67.0W



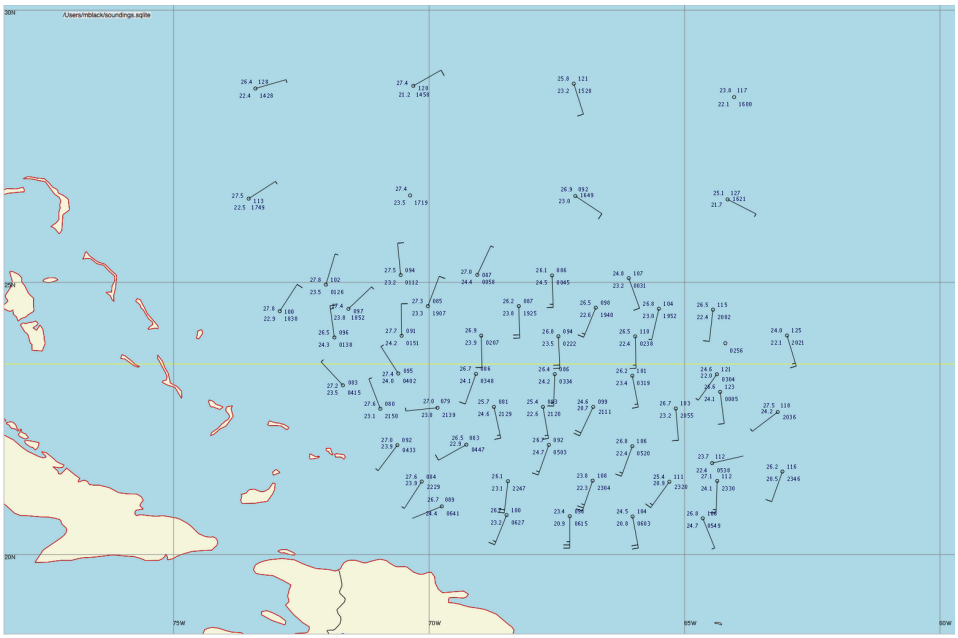
0745UTC IR Convection active to the south near 23N and to the north near 25.5N

Documentation of low level circulation:

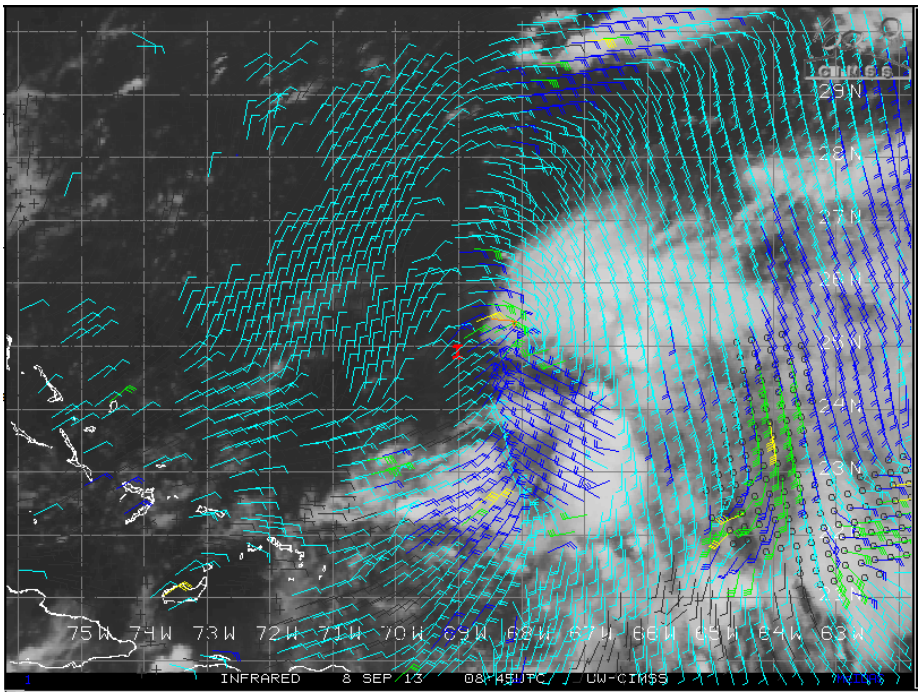
AF recon, 2030-2330Z, 7 Sep:



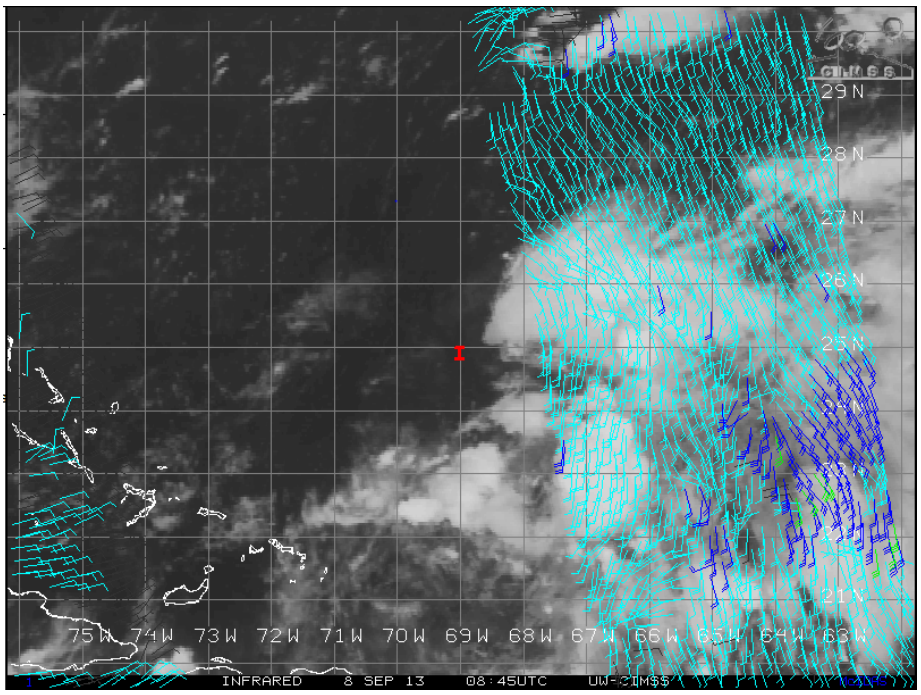
Sondes, 1000 mb: 1830Z 7 Sep – 0130Z 8 Sep-



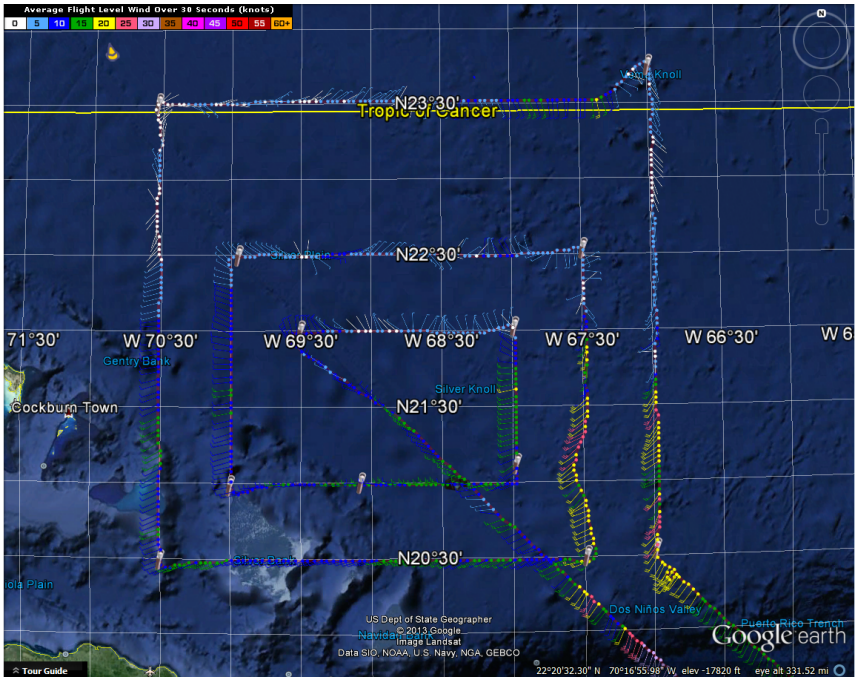
OSCAT:



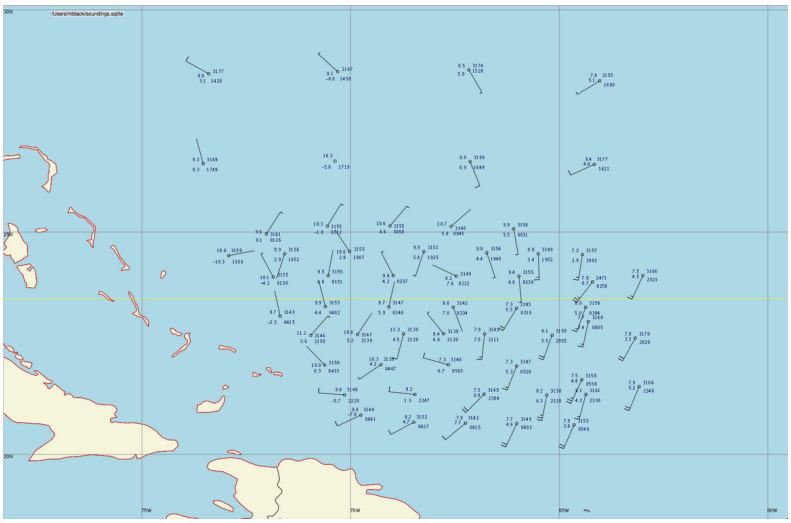
ASCAT



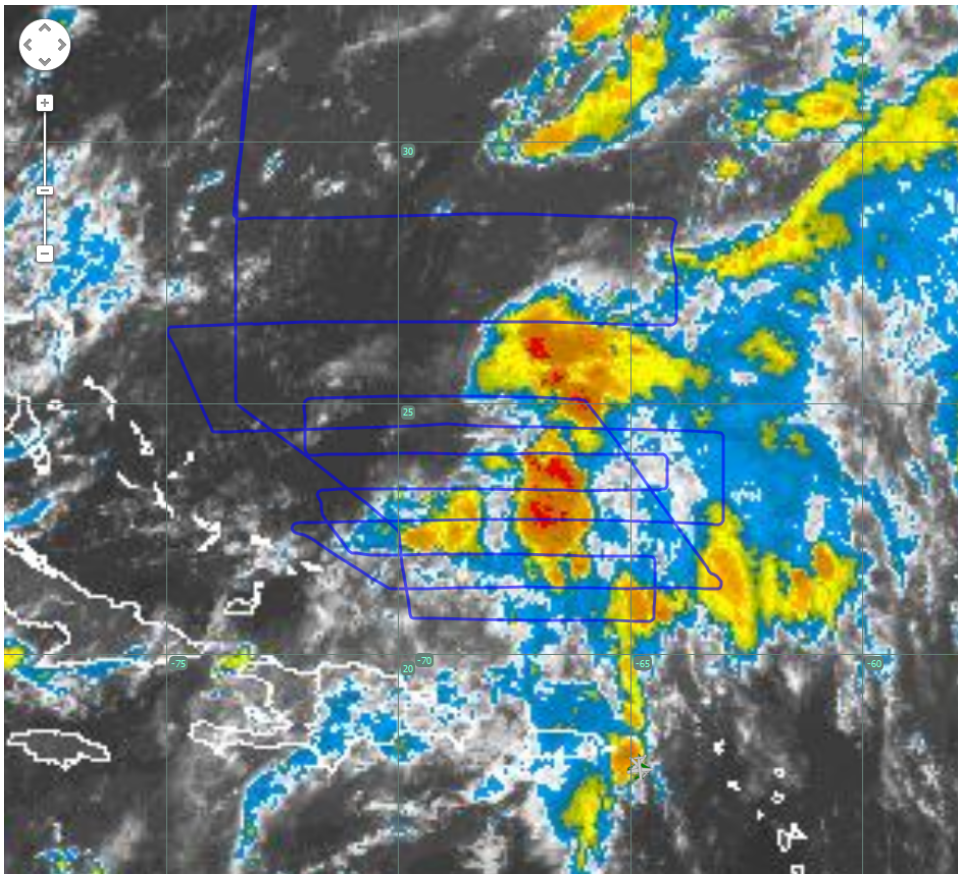
700 mb, NOAA42, 1600-2200



Sondes, 700 mb, 1830 7 Sep - 0130Z, 8 Sept



1015Z, 8 Sept

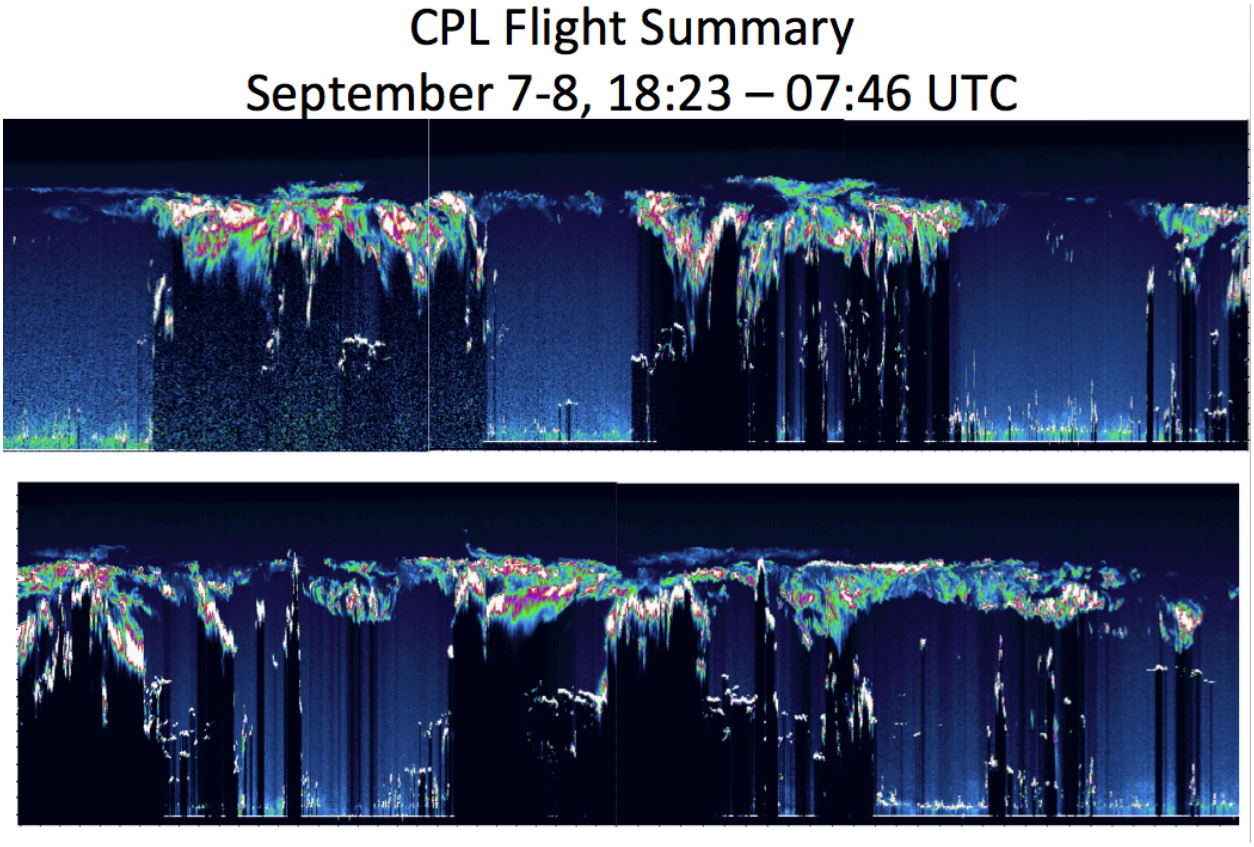


Landing- 1117 UTC 8 Sep

Instrument Summaries

CPL

CPL performed very well. Good data was acquired without interruption. GHOC real time data acquired throughout flight. No commanding problems were encountered. A slight problem was seen in the 532 nm laser energy. The readings from the instrument showed it was fluctuating. However, no indication of an effect on the data was observed. A summary image is below.



S-HIS

The S-HIS detector cooler behaved well throughout the flight, staying at 77K for the duration. A procedure was added to the flight checklist – both for the S-HIS log and the Payload Manager notes – to add a long (~15 minutes) power cycle to S-HIS 45 minutes before the first science waypoint (W01). The intent of this long power cycle addition is to 'reset' the cooler to nominal behavior and the timing of the power cycle was picked to be before the first science waypoint as to not impact critical science data. The instrument was powered down at 1344 UTC and back up at 1406 UTC, and the detector temperature returned to nominal values by 1416 UTC, and remained nominal for the remainder of the flight. Several multilayered clouds were observed during flight giving a nice comparison between the realtime products and quicklooks of S-HIS and CPL. Additionally, the S-HIS realtime retrievals had nice agreement with major features of the AVAPS dropsondes during the flight.

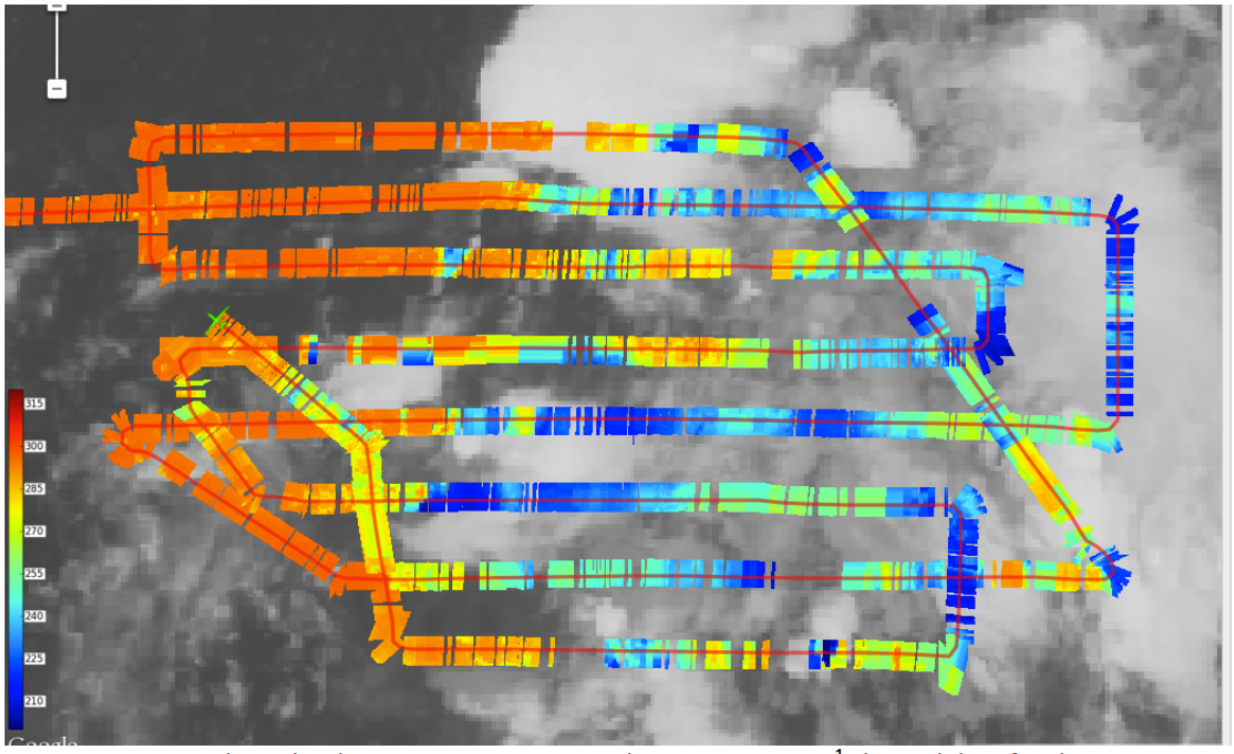


Figure 1: S-HIS realtime brightness temperatures in the 895 to 905 cm^{-1} channel data for the entire portion of the science flight superimposed on the current GOES IR image.

AVAPS

AVAPS successfully deployed all requested 57 sondes during the flight of 20130907 and data quality was again generally very good. We experienced 2 fast falls during this flight and a third partial fast fall where the sonde slowed at approximately 250 mb. During one of the fast falls, the parachute cap likely did not open at all and the thermodynamic data was deemed suspect as well as the wind measurements. A couple of soundings experienced some suspiciously elevated winds just in the last second or two before splash and the data were flagged. This problem has been observed in a small number of soundings this campaign and we are exploring if there is any systematic issue that can be addressed. During this flight we also experienced a mechanical anomaly in which one sonde failed to load properly and then became free in the bottom of the dispenser area. This prevented access to one of the columns of loaded sondes, but did not pose a safety of flight or launching issue. The precise cause of this failure is being explored but should not impact or delay any future proposed flights. Finally, during post-flight testing a minor issue with a card in the data computer was detected. Since no immediate flights are planned for AV-6, we have requested removal of our data system so that the card can be tested and replaced if necessary as a preventative measure.

Sondes Dropped

Qty	Date	Flight
6	8-01-13	Range Flight
15	8-20-13	RF01

54 8-24-13 RF02
72 8-29-13 RF03
80 9-04-13 RF04
57 9-07-13 RF05

284 Total Deployed as of 9-07-2013

As of 9-09-2013
Total Sondes available: 266 (550-284=266)